New Nouveau Brunswick

1990 ANNUAL REPORT

PROVINCE OF NEW BRUNSWICK

RELATING TO THE
CANADA/NEW BRUNSWICK AGREEMENT
RESPECTING A SULPHUR DIOXIDE
EMISSION REDUCTION PROGRAM
FOR THE CALENDAR YEAR 1990

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Executive Summary

The Province of New Brunswick has agreed to reduce annual emissions of sulphur dioxide to 185,000 tonnes by 1994. In 1990, New Brunswick agreed to examine the potential to make a further 10,000 tonne reduction.

New Brunswick is awaiting results of a study by Environment Canada, as required under Section 5 (vi) of the Agreement, to determine the feasibility of further reductions through fuel switching before confirming a further commitment.

A survey of all sources of SO_2 over 100 tonnes per year was completed to determine 1990 emissions and any changes planned prior to 1994. Although information is not yet available for the combined effect of smaller sources, results show New Brunswick to be well on target for meeting its original commitment of 185,000 tonnes per year.

The non-utility sector of the economy will continue to be responsible for less than 30% of the provincial emission target. The range of options originally presented by N.B. Power continues to narrow as implementation decisions are made.

Results from two years of intensive acid deposition monitoring indicate a substantial sector of the province is still receiving excessive sulphate deposition, up to four times the critical loads recently advanced by the Research and Monitoring Committee (e.g. >30 kg/ha yr, critical load 8 kg/ha/yr). Monitoring is continuing at 11 sites in New Brunswick, and will commence at three new stations in the north-east in spring 1991. Deposition levels will be watched closely as SO_2 emissions are reduced.

Strategies to address the continuing undesirably high deposition levels will be considered in light of the results of a modelling study for the province, expected by May 1991.

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Introduction:

The Canada/New Brunswick Agreement, signed in 1987, confirmed our resolve to participate with the other eastern Canadian provinces in reducing emissions of acid rain causing sulphur dioxide emissions by 50%. New Brunswick is a minor contributor to the North American total, but has offered a significant reduction and will continue to study the need and potential for further reductions to protect local environments.

The prime purpose of the New Brunswick Agreement and those completed between Canada and the other eastern provinces was to formalize the negotiated reductions. The agreements require regular reporting of progress to the other partners and the public, and provided information that assisted in the development of a similar agreement with the United States.

This report summarizes information on the impact of long-standing provincial policies and legislation on SO_2 emissions, progress since 1980, projections for the future, control options, and monitoring efforts.

New Brunswick has agreed to an annual emission target, to be achieved by 1994, of no more than 185,000 tonnes of sulphur dioxide. Emission rates fluctuate widely depending on various economic forces. The new energy policy introduced by the Province targets a longer term solution to these wide fluctuations and overall emission reductions.

A large portion of the emission fluctuation in New Brunswick is a result of electric power interconnections with other provinces and states. The Province is often called upon to assist other utilities facing shortages or unplanned equipment outages.

For example, a cable across the Northumberland Strait to supply electrical energy from New Brunswick enabled Prince Edward Island to fully meet their SO_2 Reduction Agreement. Export sales of New Brunswick electricity to Quebec, Nova Scotia and to U.S. utilities helped these jurisdictions avoid utilization of their fossil-fueled thermal units, serving to reduce their emissions.

Although New Brunswick has a very diversified electrical generation system, these interconnections and the agreements that surround them exact a price in terms of emissions, as increased demand means additional load on our fossil-fuel units. However, our geographical location is such that the interconnections are essential for the provision of safe, reliable electric power in eastern Canada and the U.S. This report will show how N.B. Power plans to accommodate such unexpected demands while still meeting New Brunswick's commitment on emission reductions.

Labour disruptions, general economic conditions and revised operating plans in the industrial sectors are reflected in the emission figures for the non-NB Power portion.

Legislation:

The New Brunswick Clean Environment Act furnishes the authority under which releases of contaminants into the environment are regulated. The Air Quality Regulation under that Act specifies approval requirements, sets air quality standards, and limits the maximum sulphur content of fuel oils. The Environmental Impact Assessment Regulation also requires that emissions from many new or modified sources are reviewed in a much broader context, allowing public input to final decisions on controls.

Approvals are used to ensure that each local airshed is properly managed. In the past, this has meant emission restrictions to ensure that the ambient air quality standards were met with a margin set aside for future industrial growth. Now, as more is known about the impact of local sources on acid deposition, and as the Province enters into various agreements to limit the emission rate of sulphur dioxide and other pollutants, the same mechanism is available to adjust emission rates as required. Most significant sources of SO_2 now operate under approval of the Minister.

Policy:

The basic tenets of New Brunswick sulphur dioxide control policy are as outlined in our legislation. A maximum sulphur content has been set for petroleum products. However, where lower emissions are necessary on a continuous or an occasional basis, the approval system is used to reduce allowable fuel sulphur content or to require the use of supplementary fuels.

Industry has been permitted to emit only to the extent that accepted models would indicate that their impact will meet the federal guidelines for desirable ambient sulphur dioxide concentration, which is one-half of the provincial standard, and only to an extent that the aggregate of the impact of all local sources ensure that the provincial standard is met.

This policy extends to existing sources, and has been successful in reducing the number of air quality stations recording exceedances of the Provincial hourly SO_2 standard. Average annual ambient concentrations at most stations have also generally shown significant decreases, indicating that the policy has served as a driving force to reduce emissions.

The recent agreements to limit total sulphur dioxide emissions to 185,000 tonnes annually also became driving forces for air quality management. More specific policy is applied to individual sources or source sectors as outlined below.

1. N.B. Power - Thermal Electric Power Generation

The province has been striving since the signing of the U.S.-Canada Memorandum of Intent to develop a comprehensive policy on sulphur dioxide emissions from this sector. This

has been particularly difficult due to the interconnections with other provinces and the U.S., the unknown impact of federal policies the use of indigenous high sulphur coal, and the excess capacity on hand during the mid-1980's.

It became apparent that new generation was needed due to high demand growth and reduced availability of imports. N.B. Power developed a generation plan and an emission strategy plan. The emission strategy plan was in response to the determination that for the Province to meet its commitments to the Eastern Canadian SO_2 Reduction Plan and subsequent agreements, and to the New England Governors/Eastern Canadian Premiers Conference, total annual emissions of sulphur dioxide from thermal power generation must be limited to 130,000 tonnes. In addition to this so-called "Bubble" concept, the strategy requires that ambient air quality standards must be met.

N.B. Power submitted reports on their emission and generation strategies for the government's technical review as part of the Belledune EIA process. They have recently been updated to account for recent decisions regarding the addition of new controls and generation equipment and the addition of new fuels.

N.B. Power operates four major thermal plants and is building a fifth plant at Belledune. The components of the control program include:

1. Conversion of 200 MW of Minto coal-fired generation and 100 MW of oil-fired generation at Dalhousie to Orimulsion fuel including the addition of a 90% (nominal) efficient scrubber by 1994.

2. Construction of a new 450 MW coal-fired unit at Belledune by 1993 to meet the federal SO_2 emission guidelines.

3. Use of 1% sulphur oil at the Courtenay Bay station during the summers, 1 June to 15 September.

4. Utilization of lower sulphur oil in existing oil-fired units as necessary to achieve the Bubble limit.

5. Implementation of a Demand Side Management Plan that currently includes street lighting and efficient household appliance projects and will soon include measures in the industrial and commercial sectors.

Utilization of Minto coal would be maintained at no more than 500,000 tonnes per year. Environmental Impact Assessments will be expected to examine in detail the impacts associated with the atmospheric and other emissions.

If current schedules can be achieved, the plan will result in the emissions of 115-130,000 tonnes per year for each year from 1994 to 2000. These projections are based on average temperature and rainfall amounts as provided by Environment Canada and assume continued sales from Point Lepreau which are by no means certain. Further Demand Side Management measures are not included.

New generation is assumed to be a mixture of coal fired conventional plants and combustion turbines. The impact of extension of the natural gas pipeline has not been assessed.

2. Pulp Mills

New Brunswick's pulp mill complexes completed modernization plans designed to bring them into compliance with the Pulp and Paper Industry Emission Regulation in 1990. Strong markets have created pressure for full production at all mills, and expansion at some. However, it is anticipated that this sector will reduce sulphur dioxide emission levels to less than 15,000 tonnes per year, although additional regulatory initiatives may be necessary.

3. Brunswick Mining and Smelting

This [illegible] of the best controlled in North America capturing 80-82% of the sulphur input to the plant. However, recent improvements in the monitoring system and new modelling studies indicate that due to low stack heights, flue gas [illegible] velocities the complex cannot consistently meet New Brunswick air quality standards. In the short-term, the smelter has upgraded equipment and operating procedures at the sintering machine and within the acid plant. Medium-term changes such as new stacks have been examined and longer-term changes in the smelting process studied. The 1990 emissions were considerably reduced by these short term changes, and also due to labour disruptions.

4. Irving Oil Refinery

The largest refinery in North America continues to operate at a high throughput and meet daily emission standards imposed at the time of its last expansion. This approval would allow up to some 8,000 tonnes per year of sulphur dioxide emission. The refinery typically operates well below this level.

5. Industrial Boilers

The province has developed an inventory of any boilers using Bunker fuel. Information on fuel use and sulphur content is updated regularly. This data is monitored closely to determine if the sulphur in fuel allowance must be adjusted in their operating permits.

6. Energy Demand

An energy policy for the province was released in 1990. Energy conservation and energy efficiency are primary initiatives to be undertaken. The province has begun by completing a major demand side management study in the electricity sector and is proposing an Energy Efficiency Act that will specify efficiency requirements for major residential appliances. A broader study of the potential for energy efficiency is to be completed in 1991.

7. Energy Supply

The Province continues to examine all options for meeting its energy needs, factoring in the emission standards to be achieved and emphasizing the need for conservation and improved energy efficiency. The use of wood waste continues to be encouraged. Proposals for the construction of a wood-fired electricity generation plant are being sought. N.B. Power experimented unsuccessfully with this fuel at its fluidized bed plant in Chatham. Pulp mills are continuing to use additional wood waste to meet their steam demands. Co-generation development is a major initiative in the Provincial Energy Policy.

N.B. Power has modified its hydro-electric plant at Mactaquac and continues to investigate future changes and additions to their hydro system. However, no major new hydro developments are likely. Construction on two new fuel oil fired gas turbines began in 1990, to meet predicted increases in peak demands beginning in the winter of 1991.

Current Emission Estimates:

The results of a survey of sources emitting more than 100 tonnes per year are reported in Table 1. The "Area Sources" category includes smaller sources such as industrial and commercial boilers. Some estimates are necessarily included as the data is not yet available from Environment/Statistics Canada.

Emission Projections:

The foregoing outlines how New Brunswick will meet the terms of the Agreement. The Province continues to monitor closely the emission totals resulting from these policies, and will fine-tune the conditions of approvals or take any other steps necessary to ensure compliance with the Agreement. The government will be assessing its ability to accept an additional 10,000 tonne per year reduction in the near future.

Deposition Trends:

A cooperative program involving the New Brunswick Department of the Environment and NB Power, with 20 wet deposition monitoring sites, concluded two years of operation in May 1990. The results of this project confirmed that pollutant deposition is most severe in the south of the province, where 12-month sulphate deposition regularly exceeds 20 kg/ha/yr, occasionally reaching >30 kg/ha/yr near the Fundy coast (Figure 1).

Other parameters, such as mean pH, nitrate deposition, individual acid rain events or solute concentrations are also most adverse in southern regions. In a recent review of long range transported air pollutants, the Federal/Provincial Research and Monitoring Coordinating Committee (RMCC) put forward revised critical loads for ecosystem protection, recommending ≤ 8 kg/ha/yr of wet sulphate for all of New Brunswick. The report also cited model predictions that despite major cuts in regional SO_2 emissions, acid deposition in the Maritime region is unlikely to diminish significantly. Rather, improvement will be largely confined to Ontario and Quebec.

Thus acidification is likely to remain a serious concern in New Brunswick for at least the next 5-10 years. More emission controls may be necessary in the southern airshed to avoid widespread, lasting acidification of sensitive watersheds and terrestrial ecosystems. However, even the most thoroughgoing action within the province may be insufficient to reduce deposition to below the critical load, except possibly in the far north.

Mitigative techniques are under consideration, but at present there are apparently no methods which can effectively counteract acidification over large areas without damaging ecosystems in other ways. Such "band-aid" methods in any case do not offer a long-term solution; the problem has to be tackled at source.

Development and calibration of an acid deposition model for the province, using data gathered in 1988-90, is advanced: final results are expected by May 1991. This work should aid in designing further emission control measures, as the model should allow the relative contribution of many large point sources to acid deposition across New Brunswick to be estimated.

Updated deposition data are presented in Table 2. Monitoring continues at 11 sites (Figure 2), and three more will begin operation in the north-east in May 1991.

TABLE 1: SULPHUR DIOXIDE EMISSIONS (KILOTONNES)

	1980	1988	1989	1990	1994
NB Power					
Coleson Cove	54.5	58.4	74.0	58.5	
Dalhousie	20.0	61.1	60.3	45.8	
Grand Lake	33.0	27.6	28.2	21.1	
Courtenay Bay	15.0	10.2	14.0	15.5	
Other	0.0	0.6	0.4	0.2	
Sub Total	122.5	157.6	176.9	141.1	130.0
Pulp Mills					
REPAP-Nelson	0.1	0.3	0.4	0.4	
REPAP-Newcastle	2.0	1.1	1.7	3.1	
Stone Consolidated	4.1	0.4	0.4*	0.4	
Frasers-Atholville	5.5	1.8	1.6*	1.5	
Frasers-Edmundston	24.6	3.9	3.8	3.8	
Irving Pulp and Paper	6.8	2.6	4.0*	4.4	
Lake Utopia Paper	1.5	1.3	1.3*	1.4	
NBIP Forest Products	4.0	1.7	2.0*	2.2	
Irving Paper	0.2	0.5	0.4*	0.3	
Ste Anne Nackawic	4.6	0.6	0.6	0.6	
Kimberley Clark	0.3	0.3	0.3*	0.3*	
Sub Total	53.5	14.5	15.0	18.4	15.0
Other					
Brunswick Mines	2.0	1.5*	1.5*	1.0	
Brunswick Smelter	12.8	21.2	21.6	5.5	
Irving Oil Refinery	4.7	5.3	4.7	6.1	
Sub Total	19.5	28.0	27.8	12.6	25.0
Area Sources					
Residential	3.6				
Other Industrial	10.0				
Commercial	8.2				
Transport	2.1				
Miscellaneous	0.2				
Sub Total	24.1	15.0*	15.0*	15.0*	15.0
ANNUAL TOTAL	219.6	215.1	234.7	187.1	185.0

* = Provisional data

TABLE 2: Sulphate and Nitrate Deposition in New Brunswick (kg/ha/yr)

Station	1985	1986	1987	1988	1989	1990
			SULPHATE			
Nictau	20.4	16.4	13.6	13.7	14.5	19.7
Harcourt	11.0	14.2	14.3	14.0	13.8	16.6
Frog Lake	19.8	*26.1	-	-	-	-
Forest Hills	36.7	31.2	-	-	-	-
Lonewater Farm	13.3	21.0	11.4	18.8	20.0	-
Musquash	22.7	24.4	19.3	20.3	28.6	-
Darling's Island	14.8	23.7	14.3	[illegible]	-	-
Magaguadavic Lake	-	*19.1	13.7	13.1	[illegible]	
Pennfield				*19.9	25.2	24.9
Bonny River				*19.5	24.2	22.7

Station	1985	1986	1987	1988	1989	1990
			NITRATE			
Nictau	10.4	9.3	6.1	12.7	10.5	14.9
Harcourt	6.7	9.3	5.8	10.7	11.3	12.7
Frog Lake	15.3	*17.6	-	-	-	-
Forest Hills	12.1	13.6	-	-	-	-
[illegible]water Farm	9.8	10.2	3.8	14.6	14.1	-
[illegible]sh	16.0	12.4	10.9	13.0	21.6	-
[illegible]ng's Island	9.4	15.8	7.5	11.9	16.9	-
Magaguadavic Lake	-	*12.9	9.0	8.7	13.6	-
Pennfield				*12.3	19.7	17.8
Bonny River				*13.2	19.1	17.0

* site did not operate all year; estimate of annual deposition based on precipitation data for the full year from an adjacent site, and the volume-weighted mean concentration for the available period of record.

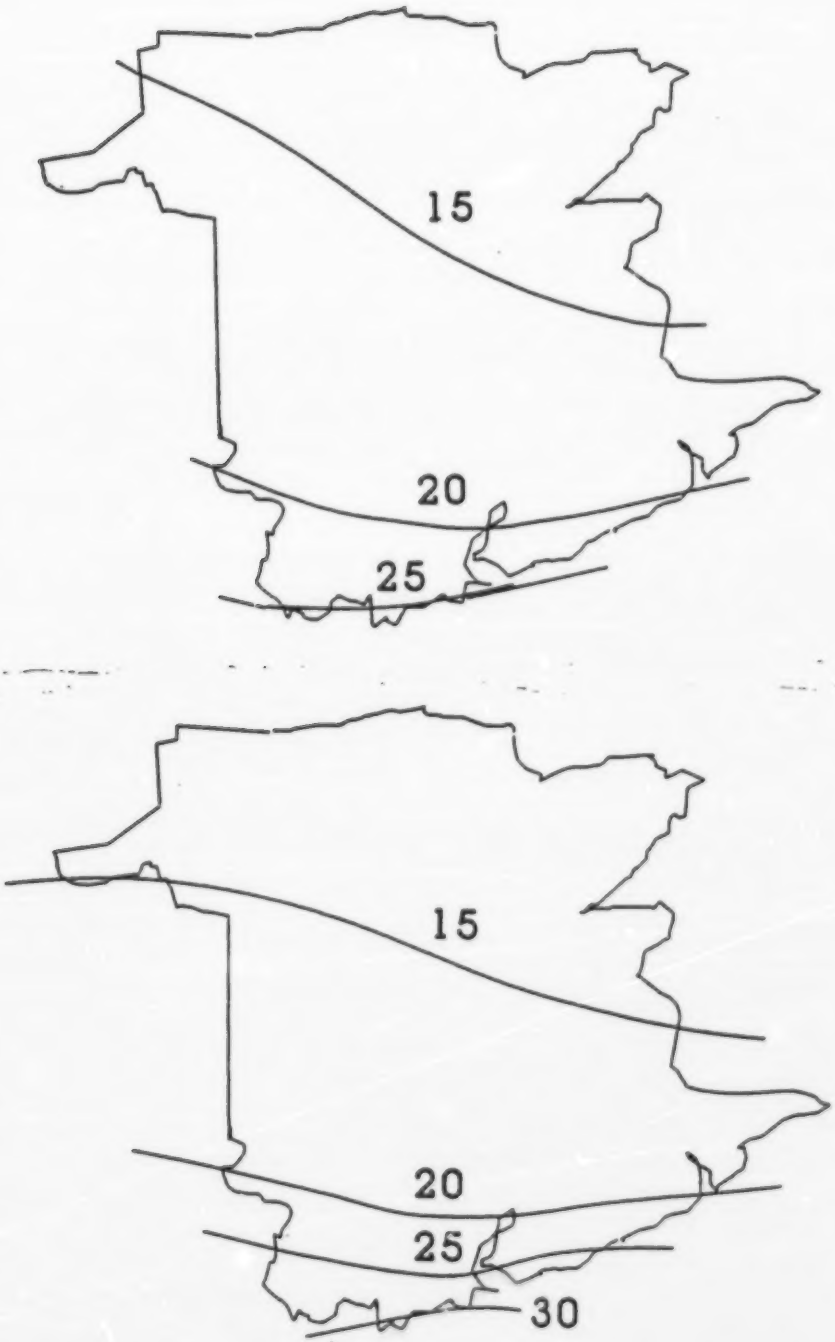
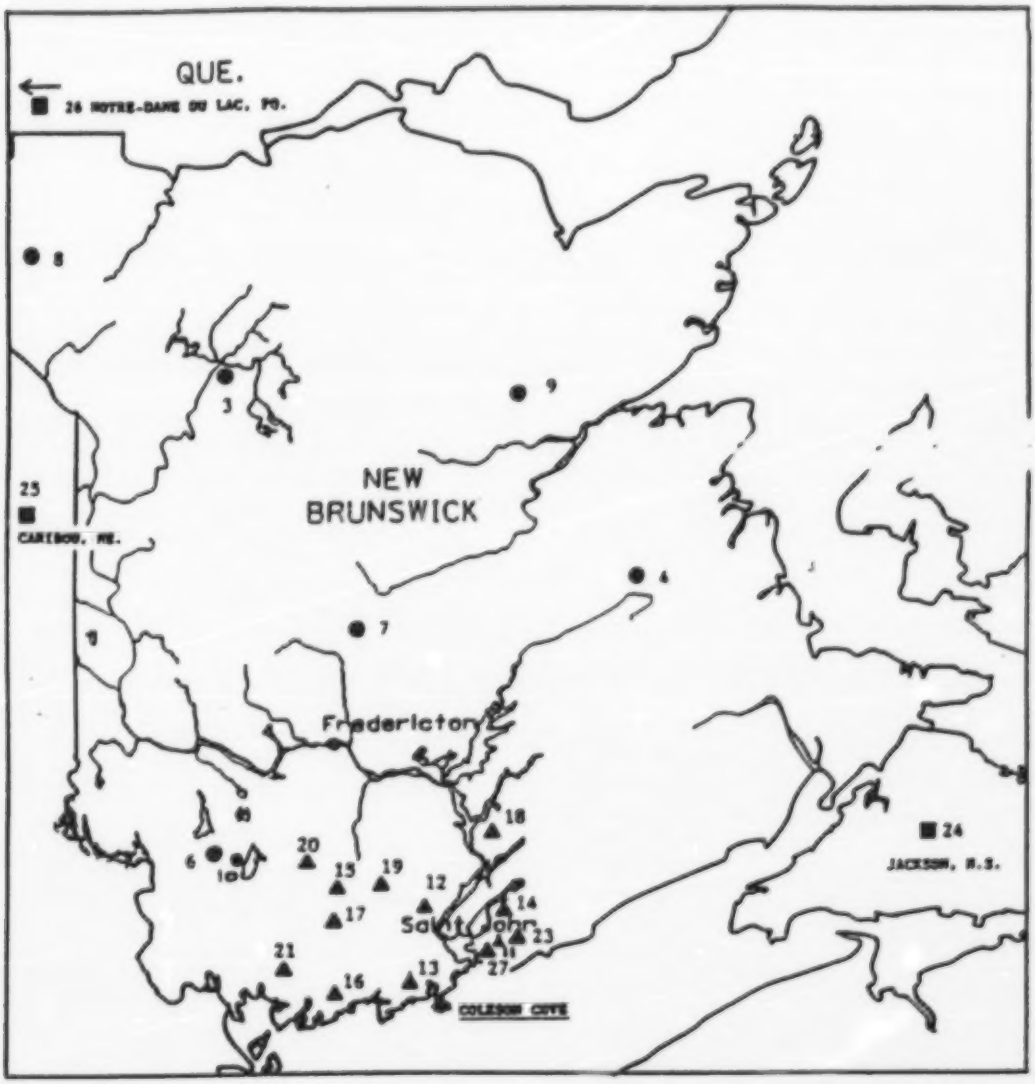


Figure 1: Marine-corrected sulphate deposition (kg/ha) in New Brunswick for May 1988 - May 1989 (top) and May 1989 - May 1990 (below).



SITE LOCATIONS

3	NICTAU	11	FOREST HILLS*	18	SHANNON
4	HARCOURT	12	LONEWATER FARM*	19	WIRRAL*
6	MAGAGUADAVIC LAKE*	13	MUSQUASH*	20	TRACY
7	HOLTVILLE	14	DARLINGS ISLAND*	21	BONNY RIVER
8	SECOND FALLS	15	JUVENILE SETTLEMENT*	23	GOLDEN GROVE*
9	TROUT BROOK	16	PENNFIELD	27	LAKEWOOD HTS
10	FROG LAKE*	17	S. OROMOCTO LAKE		

* = site closed

2: Locations of wet deposition monitoring sites in New Brunswick.